

## REMARKS

### Specification Amendments

The specification is amended to correct the spelling of the word "temporomandibular." As well, the specification is amended to revise the claim heading.

### Claim Amendments

New claims 25-68 replace claims 1-24 presently on file. Claims 1-24 are withdrawn from consideration, and are cancelled herewith without prejudice. Applicant respectfully requests entry of new claims 25-68. New claims 25-45 are method claims, while new claims 46-68 are apparatus claims.

To assist the Examiner, Applicant informs that the subject matter of old claims 1-24 has been incorporated into new claims 25-68 which better define the invention. The new claims are not believed to introduce any new matter. Support for the new claims is found throughout the application and in the as-filed claims as set forth below:

Old claim	New claim	Revision and Support
1-24	25-68	Reference numerals objected to in old claims 1-24 have been omitted in new claims.
1	25	Reworded for clarity. Support resides in the specification and old claims 1 and 17.
	26	Support resides on page 5, line 6 of the specification.
2	35	Reworded for clarity. Support resides on page 6, lines 26-28 of the specification and old claim 2.
17	34	Reworded for clarity. Support resides on page 4, lines 5-6 of the specification and old claim 17.
3	45	Reworded for clarity. Support resides in the specification and old claim 3.

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4	30	Reworded for clarity. Support resides on page 6, line 17 of the specification and old claim 4.
	31 and 32	Support resides on page 6, line 17 of the specification and in old claim 4.
	27	Support resides on page 6, lines 13-14 of the specification and old claims 5 and 6.
5	28	Reworded for clarity. Support resides on page 6, line 13 of the specification and in old claim 5.
6	29	Reworded for clarity. Support resides on page 6, line 14 of the specification and in old claim 6.
7	36	Reworded for clarity. Support resides on page 4, line 17 of the specification and in old claim 7.
8, 12, 13,18	37-38	Reworded for clarity. Support resides on page 4, lines 18-19 and 22; page 6, line 28; page 7, lines 1-2 and 11-20 of the specification and in old claim 8.
18	39	Reworded for clarity. Support resides on page 7, lines 11-18 of the specification and in old claim 18.
9, 22	45	Reworded for clarity. Support resides on page 3, lines 23-24; page 6, line 21; and page 7, lines 5-7 of the specification and in old claim 9.
10		Subject matter not in new claims.
11, 19	40	Reworded for clarity and to ensure proper antecedent basis. Support resides on page 4, lines 23-24 of the specification and in old claims 11 and 19.
14-17, 23	33	Reworded for clarity. Support resides on page 4, lines 5-11 of the specification and old claims 14-17.
19	41, 44	Reworded for clarity. Support resides on page 6, lines 22-23 and page 7, line 16 of the specification and in old claim 19.
20	42-43	Reworded for clarity. Support resides on page 6, lines 24-25; and page 7, lines 13-15 of the specification and in old claim 20.

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21	25	Reworded for clarity. Support resides in the specification and old claims 17 and 21.
24	46	Apparatus claim reworded for clarity, and dependent apparatus claims 47-68 added. Support resides throughout the specification and in old claims 17 and 24.
	47	Support resides on page 5, line 6 of the specification.
	48	Support resides on page 6, lines 13-14 of the specification.
	49	Support resides on page 6, line 13 of the specification.
	50	Support resides on page 6, line 14 of the specification.
	51-53	Support resides on page 6, line 17 of the specification.
	54	Support resides on page 6, lines 27-28 of the specification
	55	Support resides on page 4, lines 5-11 of the specification.
	56	Support resides on page 4, lines 5-6 and page 6, lines 27-28 of the specification and in old claim 17.
	57	Support resides on page 6, lines 26-28 of the specification.
	58	Support resides on page 4, line 17 of the specification.
	59	Support resides on page 4, line 18 of the specification.
	60	Support resides on page 4, lines 18-19 and 22; page 6, line 28; page 7, lines 1-2 and 11-20 of the specification.
	61	Support resides on page 7, lines 11-18 of the specification.
	62	Support resides on page 4, lines 23-24 of the specification.
	63	Support resides on page 6, lines 22-23 and page 7, line 13 of the specification
	64	Support resides on page 6, lines 24-25; and page 7, lines 13-15 of the specification.

	65	Support resides on page 7, line 14 of the specification.
	66	Support resides on page 7, line 16 of the specification.
	67-68	Support resides on page 3, lines 23-24; page 6, line 21; and page 7, lines 5-7 of the specification.

Applicant believes that the new claims define the invention in a manner supported by the original application, and in a manner so as to render moot certain of the rejections, as set out in greater detail below.

#### Minor Informalities

The Office Action states that the claims should start with the phrase "what is claimed is." Applicant has amended page 9 of the specification accordingly.

Further, Applicant has amended the paragraph on page 4, lines 1-4; the paragraph bridging pages 6 and 7; and the paragraph on page 8, lines 11-19 of the specification to correct the spelling of the word "temporomandibular."

#### Information Disclosure Statement

The Office Action states that the listing of references in the specification, specifically the background of the invention, is not a proper information disclosure statement.

To comply with 37 C.F.R. 1.98(b), Applicant respectfully submits Form PTO-1449 listing references, including those cited in the International Search Report dated February 16, 2004 of Applicant's corresponding International Publication No. WO 2004/034937 A1, and encloses copies of the references for the Examiner's consideration.

Applicant wishes to highlight to assist the Examiner in the review of this art, that none of the listed references relate to using mechanical vibrations derived from tooth clicks to assist a person in controlling a device or process as briefly summarized below:

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Type of Document as listed on the IDS	Inventors	General Subject Matter
U.S. Patents	Frielingsdorf <i>et al.</i> , May, Nolan, Youdin <i>et al.</i>	apparatus for voice or throat-actuated control of a device
	Muller	apparatus for blowing/suction airflow control of a device
	Bryuzgin	head set apparatus for detecting jaw-lowering to control a device
	Lauks <i>et al.</i>	intraoral apparatus for monitoring various oral factors
	Christensen, Dordick <i>et al.</i> , Fortune <i>et al.</i> , Salem <i>et al.</i>	intraoral apparatus for tongue-actuated control of a device
	Summer	intraoral apparatus for sensing tooth contact to analyze stability of a person's bite
	Prochazka <i>et al.</i>	apparatus capable of functional neuromuscular stimulation for restoration of hand grasp
	Burnett, Burnett <i>et al.</i>	voice detection and noise suppression systems
Foreign Patents	Mitchell, Snape, Wilson	intraoral apparatus involving tooth contact to activate pressure sensors to control a device
	PCT applications	voice detection and noise suppression systems
Other Documents	various authors	functional neuromuscular stimulation for restoration of limb movement, e.g., hand, leg

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## Claim Objections

With regard to the claim objections set forth on pages 2-4 of the Office Action, Applicant respectfully submits that although old claims 1-24 have been cancelled, the new claims 25-68 address the Office Action's claim objections as summarized below:

- Applicant's new claims 25-68 omit reference numerals which were objected to in old claims 1-24.
- The Office Action indicated improper antecedent basis in old claims 3 and 18. Applicant has reviewed the new claims to ensure proper antecedent basis.
- The Office Action states that it is unclear what is meant by the word "process" in the phrase "bony mastoid process" in old claim 5. This term appears in Applicant's new claims 25, 27, 28, 46, 48 and 49. Applicant clarifies that the term "bony mastoid process" refers to a specific anatomical structure, namely the conical protuberance of the posterior portion of the temporal bone which is situated behind the human ear. For clarity, Applicant has provided excerpts from "Gray's Anatomy. 36<sup>th</sup> Edition" (1980, Eds. Williams, P.L. and Warwick, R. Churchill Livingstone: London, pp. 328-329), wherein the term "mastoid process" is defined as "a conical projection" on page 328, paragraph 4, and is illustrated *in situ* on the left temporal bone in Figure 3.96 on page 329. Applicant submits that the term "bony mastoid process" is an anatomical term well understood by those skilled in the art.
- The Office Action objected to use of the word "overlying" in old claim 6, suggesting rewording to "is positioned over." In new claims 25, 27, 46 and 48, Applicant has included similar language recommended by the Office Action.
- The Office Action states that old claim 8 should be reworded for a Markush grouping. Old claim 8 has been recast as new claims 36-38, omitting the need for a Markush grouping.
- The Office Action states that in old claim 11, the phrases "the temporal pattern" and "the intensity" lack antecedent basis. In new claims 40 and 62, Applicant has replaced the

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definite article "the" with the indefinite article "a" in the phrase "the temporal pattern" to provide proper antecedent basis. The definite article "the" has been deleted in the phrase "the intensity."

- The Office Action states that in old claim 15, the phrase "a springy headpiece of the type used in earphones" and the specification does not adequately describe what is exactly meant by these features, other than to simply repeat the aforementioned features, so that one of ordinary skill in the art would have an adequate understanding of the claimed invention. For clarity, Applicant's new claims 33 and 55 recite the phrase "a spring loaded headpiece," an example being part (100) illustrated in Applicant's Figure 4. This terminology is well understood by those skilled in the art.
- The Office Action states that in old claims 19-20 and 22-23, the verb requires amendment. Applicant has reviewed the new claims to ensure proper verb tense.

#### Claim Rejections Under 35 U.S.C. § 103

Claims 1-6, 9-16 and 19-24 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Nemirovski (U.S. Patent Application No. 2002/0143242) in view of Yoshizawa *et al.* (U.S. Patent No. 4,392,244).

Claims 7-8 stand rejected as being unpatentable over Nemirovski's combined system, as applied to claim 1 above, and in further view of Simmons (U.S. Patent Application Publication No. US 2003/0120183).

Claim 17 stands rejected as being unpatentable over Nemirovski's combined system, as applied to claim 1 above, and in further view of obviousness.

Claim 18 stands rejected as being unpatentable over Nemirovski's combined system, as applied to claim 1 above, and in further view of Petrofsky (U.S. Patent No. 4,558,704).

In view of the claim amendments, Applicant respectfully submits that patentable subject matter is now defined in the claims. As well, and as set out below, Applicant respectfully does not agree with the characterizations of the prior art as provided in the Office Action, and further submits that the Office Action's combination of the prior art is improper in that a *prima facie*

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case for obviousness has not been made. Applicant submits that new claims 25-68 are distinct from the above cited prior art, and arguments in support of the patentability of Applicant's claimed invention are provided hereinbelow.

### Tests for Obviousness Under 35 U.S.C. §103

Ascertaining the differences between the cited prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole. In determining the differences between the prior art and the claims, the question under 35 U.S.C. §103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious (*Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983)).

In determining whether the invention as a whole would have been obvious under 35 U.S.C. 103, we must first delineate the invention as a whole. In delineating the invention as a whole, we look not only to the subject matter which is literally recited in the claim in question... but also to those properties of the subject matter which are inherent in the subject matter *and* are disclosed in the specification. . . Just as we look to a chemical and its properties when we examine the obviousness of a composition of matter claim, it is this invention *as a whole*, and not some part of it, which must be obvious under 35 U.S.C. 103. In re Antonie, 559 F.2d 618, 620, 195 USPQ 6,8 (CCPA 1977).

The Federal Circuit has cautioned against hindsight reconstruction of the claimed invention by picking and choosing among isolated disclosures in the prior art to deprecate the claimed invention. In re Fine, 837 F.2d 1071, 5 USPQ 2d 1596 (Fed. Cir. 1988). In particular, the court stated:

It is error to reconstruct patentee's claimed invention from the prior art by using the patentee's claim as a "blueprint". When prior art reference require selective combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight obtained from the invention itself. Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 227 USPQ 543 (Fed. Cir. 1985).

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The prior art must meet two criteria in order to make a claimed invention obvious. First, the prior art must suggest the invention. Second, the prior art must provide a reasonable expectation that the invention can be practiced successfully. This standard for a proper obviousness rejection is set forth in In re Vaeck, 947 F.2d 488, 493, 20 USPQ 2d 1438 (Fed. Cir. 1991), where the court stated:

Where the claimed subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under § 103 requires, *inter alia*, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill in the art would have a reasonable expectation of success. See *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ 2d 1529, 1531 (Fed. Cir. 1988). Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure. *Id.*

Further, to rely on a reference under 35 U.S.C. §103, it must be analogous prior art. The Examiner must determine what is "analogous prior art" for the purpose of analyzing the obviousness of the subject matter at issue:

In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned. In re Oetiker, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992).

#### Summary of Applicant's Claimed Invention

Before addressing the cited prior art, it is worthwhile to review briefly Applicants' invention as presently claimed. Applicant provides a method and an apparatus for assisting a person, for example a person suffering a disability after stroke, to control one or more devices or processes, for example, a cuff to stimulate muscles in the forearm. The method involves attaching a vibration sensor, capable of detecting mechanical vibrations, either on a person's head, preferably on the side of the head, or under the skin over the person's bony mastoid process or temporomandibular joint; detecting with the sensor, mechanical vibrations elicited by sudden contact of the person's upper teeth and lower teeth; generating an electrical signal from the

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sensed mechanical vibrations; and transmitting the electrical signal to the one or more devices or processes to be controlled.

Applicant's claimed invention provides numerous practical advantages. By being positioned externally on the person's head or under the skin, the sensor is unobtrusive, aesthetically pleasing and comfortable for the person. The sensor can ideally be manufactured as "one size," without needing custom fitting as required with conventional medical devices, for example, in-the-ear, or in-the-canal hearing aids. Mounting and removal of the sensor can be accomplished quickly and easily, since the sensor can be secured externally on the person's head by, for example, a headpiece such as an ear hanger, headband, the arm of a pair of glasses, adhesive or adhesive tape. Minimal surgery would be required to attach the vibration sensor under the skin over the person's bony mastoid process or over a temporomandibular joint. Importantly, attaching the sensor either on the person's head, or under the skin over the person's bony mastoid process or temporomandibular joint, eliminates the need for hand or foot movement, thus greatly benefiting quadriplegics or other disabled persons suffering from limb paralysis. In disabled persons having a degree of mobility, the hands and feet are left free for other activity.

In Applicant's claimed invention, the method of control is a "tooth click" or sudden contact of the person's upper and lower teeth. Tooth clicks elicit transient vibrations in bone of much shorter duration than those elicited by vocalization or continuous movements of the tongue or jaw. Consequently, tooth clicks are well suited as control signals. The effective detection of minimal tooth clicks is desirable in Applicant's claimed invention. Tooth damage may be avoided. Further, disabled persons may likely have voluntary control over jaw movement and even minimal impact is effective (i.e., as applied to stroke patients or other disabled persons suffering from paralysis of facial or speech muscles). Applicant's claimed invention thus requires minimal training and professional support.

As reviewed in the Background section of the application, the prior art presents technologies based upon very specific physical limitations of disabled persons. Technologies such as mouth stick controllers, mouthpieces, tongue-operated devices, eye switch devices, voice

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control devices and the like, generally require awkward, difficult physical movements and a high degree of training and proficiency by the user. Such technologies may be entirely unsuitable for a user with limited mobility or impaired speech.

The prior art has not recognized a device which accommodates the needs of many persons, including disabled persons differing in the type and severity of their physical limitations. Applicant is a person highly skilled in this art, specializing in research of electronic devices for disabled persons. To Applicant's knowledge, no prior art has recognized that tooth clicks may be effectively used by disabled persons with a vibration sensor which is unobtrusively located either on the person's head, or under the skin over the person's bony mastoid process or temporomandibular joint, to control a device or process. As set out below, Applicant's new independent claims 25 and 46 explicitly recite the specially designed method and apparatus, respectively. Dependent claims 26 and 47 recite that the sensor is located on a side of the person's head:

Claim 25:

A method for assisting a person in controlling one or more devices or processes, comprising the steps of:

- a) attaching a vibration sensor, capable of detecting mechanical vibrations, either
  - i. on the person's head; or
  - ii. under the skin over a bony mastoid process or over a temporomandibular joint;
- b) detecting with the sensor, mechanical vibrations elicited by sudden contact of the person's upper teeth and lower teeth;
- c) generating an electrical signal from the sensed mechanical vibrations; and
- d) transmitting the electrical signal to the one or more devices or processes to be controlled.

Claim 26:

The method according to claim 25, wherein the sensor is attached on a side of the person's head.

Claim 46:

An apparatus for assisting a person in controlling one or more devices or processes, comprising:

a vibration sensor capable of detecting mechanical vibrations elicited by sudden contact of the person's upper teeth and lower teeth and of generating an electrical signal from the sensed mechanical vibrations for transmitting to the one or more devices or processes to be controlled; and either:

- i. an attachment device for attaching the vibration sensor externally on the person's head for detecting the mechanical vibrations; or
- ii. an encapsulation for the sensor for placement under the skin over a bony mastoid process or over a temporomandibular joint.

Claim 47:

The apparatus according to claim 46, wherein the sensor is attached on a side of the person's head.

Support for new claim 25 resides throughout the specification and old claims 1 and 17; for example, page 6, lines 11-12 describe attachment of the vibration sensor capable of detecting mechanical vibrations "to a person's head;" page 4, lines 5-6 describe that the sensor "could be in the form of a small encapsulated device implanted under the skin;" page 6, lines 13-14 describe positioning of the vibration sensor over a person's bony mastoid process or temporomandibular joint; page 3, lines 7-8 describe detecting mechanical vibrations elicited by sudden contact of the

person's upper and lower teeth; and the paragraph bridging pages 6-7 describes generation of the electrical signal from the sensed mechanical vibrations, and transmission of the electrical signal to the devices or processes to be controlled. Support for new claim 46 resides throughout the specification as set out above and in old claims 17 and 24. Support for claims 26 and 47 resides on page 5, line 6 of the specification which recites attachment of the sensor to "the side of the user's head."

With reference to Applicant's above claim language, Applicant provides a brief analysis of the cited prior art below:

a) United States Patent Application Publication No. US 2002/0143242 to Nemirovski

- Nemirovski pertains to unrelated subject matter, namely a method of detecting an air pressure change within the user's ear involving placing a microphone at least partially within the ear, detecting the change in air pressure within the ear using the microphone, producing an electrical signal corresponding to the internally detected change in air pressure, and processing the electrical signal to produce a corresponding output.
- Nemirovski does not disclose attaching a vibration sensor, capable of detecting mechanical vibrations, on the person's head, or under the skin over a bony mastoid process or over a temporomandibular joint, as recited in Applicant's new claims 25 and 46. Ultimately, Nemirovski's intention is to detect air pressure changes within the ear (i.e., sound waves moving through air), by using an internal microphone placed at least partially within the ear. To Applicant's knowledge, the microphone used by Nemirovski to detect air pressure changes within the ear would be technically inappropriate for detecting mechanical vibrations caused by tooth clicks as conducted by Applicant. As indicated by

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Nemirovski, capacitive (condenser) microphones are suitable for detecting changes in air pressure (paragraph [0080]). However, it can be well appreciated by those skilled in the art that such microphones respond poorly to mechanical vibrations. Detection of bone-conducted vibrations on bony prominences such as the mastoid process would not be successfully achieved with Nemirovski's choice of microphone.

- Nemirovski does not disclose detecting with the sensor, mechanical vibrations elicited by sudden contact of the person's upper and lower teeth, as recited in Applicant's claims. Rather, Nemirovski teaches detection of air pressure changes caused by "vibrations of the ear drum, vibrations of bone within the ear, vibrations of other anatomical structures within the ear and vibrations conducted by the bones and/or tissue to the ear and which invoke an air pressure change in the ear" (paragraph [0035]). Further, Nemirovski's device does not detect transient vibrations or distinguish them from the more continuous signals elicited by vocalization and movements of the tongue, jaw and naso-oral cavity.
- Nemirovski makes no mention of sudden contact of the person's upper teeth and lower teeth or "tooth clicks." Rather, Nemirovski's methods of control or "forms of initiating action" are listed in paragraph [0082] as including the person's speech at a variety of volumes, clicking of the tongue against the roof of the mouth, breathing, heartbeat, thoughts, and opening of the jaw - which itself is entirely opposite to closing of the jaw as required with tooth clicks. Nemirovski thus teaches away from the use of tooth clicks, making no suggestion or mention of detection of tooth clicks or the enormous advantages of using same, as disclosed and claimed by Applicant. As the suggestion to combine must be found within the reference itself, Applicant respectfully submits that a *prima facie* case for obviousness has not been made.

- Nemirovski is not analogous prior art. In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned. Applicant notes that Nemirovski's patent has been classified in an entirely different field compared to that of Applicant's instant application. Nemirovski's patent has been classified as relating to "surgery, specifically subject matter usable in medical evaluation of a condition of a living body" (U.S. Classification 600/300). In contrast, Applicant's instant application falls within the classification of electrical communications for disabled persons (U.S. Classification 340/825.19).
  - Nemirovski addresses an entirely different problem. Nemirovski explicitly states that the purpose of the device is for detecting physical and/or mental actions of a person, for example, speech, thoughts, movements of the tongue, with respect to the oral cavity (paragraphs [0002] and [0034]), and various biological functions including heartbeat, breathing, gastronomical events which cause detectable changes in air pressure in or near the ear (paragraph [0037]). This is not pertinent to the problem with which Applicant was concerned.
- b) United States Patent No. 4,392,244 to Yoshizawa
- Yoshizawa pertains to unrelated subject matter and addresses an entirely unrelated problem. Yoshizawa's device combines a vibration pick-up type microphone for picking up bone-conducted voice signals transmitted to the external auditory canal, mastoid cells, forehead, throat and the like (column 3, lines 61-65), and a speaker for hearing received voice sounds. Impact vibrations from tooth clicks are used to switch the operational state of the same device from radio

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transmission of outgoing voice signals to radio reception of incoming voice signals or of recording these voice signals. Yoshizawa's device specifically addresses the problem of controlling the changeover of transmission and reception as described in column 7, lines 46-68 to column 8, lines 1-15:

When the transmitting and receiving person (or ear-mic wearer) clicks his lower and upper teeth to generate the impact vibration (or first control signal), the first control signal is picked up by the microphone 1; the output of microphone 1 is amplified by the amplifier 3, selected by the low-pass or band-pass filter 5, and applied as an input to the controller 6; so that the controller 6 is rendered operative to cause the changeover circuit 9 to automatically change reception to transmission. When the wearer utters voice sounds this time, bone-conducted voice signals generated by his voice sounds are picked up by the microphone 1 and transmitted outside in wireless or wired manner through the amplifier 3 and the main transmitting circuit 2. The speaker 10 is kept not to generate outputs during this period, since the main receiving circuit 7 is held under closed state.

When the wearer wants to perform reception, he may again click his lower and upper teeth to generate another impact vibration (or second control signal). This second control signal is applied as input to the microphone 1 in same way as the first control signal was; the output of microphone 1 is applied through the amplifier 3 to the filter 5; and the output of filter 5 is applied to the controller 6'; so that the changeover circuit 9 is caused by the output of controller 6' to automatically change transmission to reception. The changeover circuit 9 is kept unchanged under this state even if the wearer speaks to anyone of neighboring persons or how noisy the ambient circumstance is.

As the circuit 9, 9A or 9B employed in the present invention to automatically control the changeover of transmission and reception, are used a semi-conductor relay switch circuit and the like comprising combining a transistor changeover circuit, mechanical relay switch and transistor, and both of main transmitting and receiving circuits 2 and 7 are never caused to open or close at the same time.

Yoshizawa indicates above that an impact vibration, such as that generated by a tooth click, is employed as a control signal. Yoshizawa thus uses tooth clicks "for rendering the main circuit 2 open and closed" (column 4, lines 16-17), and for switching "the changeover of transmission and transmission stop or

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recording and recording stop." One might thus envisage Yoshizawa's device as useful for example, for hands-free voice communication by a pilot, to turn voice transmission on and off. Yoshizawa's device is specifically directed at transmitting and receiving voice signals, and only uses tooth clicks as a switch. As well, Yoshizawa's device specifically requires a speaker for hearing received voice sounds and cannot function without the speaker, as described in the above cited passage. This is not related or pertinent to the problem with which Applicant was concerned. In Applicant's invention, vocalization is a nuisance, and is intentionally discarded by use of a filter or logic circuit to detect small tooth clicks reliably and effectively. Transmitting voice signals is not the purpose of Applicant's invention, and in fact is opposite to the purpose of Applicant's device.

Thus, Yoshizawa is not analogous prior art. In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned. Yoshizawa's patent has been classified in an entirely different field compared to that of Applicant's instant application. Yoshizawa's patent has been classified as relating to "telecommunications, specifically subject matter wherein the switching device is other than manually operated such as voice operated" (U.S. Classification 455/79) (highlighting for emphasis). In contrast, Applicant's instant application falls within the classification of "electrical communications for disabled persons" (U.S. Classification 340/825.19).

Applicant's invention addresses the needs of disabled persons, assisting such persons to control one or more devices or processes using tooth clicks as a control signal; for example, stroke patients or other disabled persons suffering from paralysis of facial or speech muscles who would be unable to use Yoshizawa's device in view of its requirement for voice communication.

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However, Yoshizawa makes no mention of disabled persons, or of solving any problem associated with means for assisting disabled persons. As Yoshizawa's device is for use by able-bodied persons (e.g., a pilot for hands-free voice communication), it is not seen how Yoshizawa's device could even be used by disabled persons.

- Despite knowledge of tooth clicks as a control signal in Yoshizawa (column 5, lines 38-52), Applicant notes that Yoshizawa teaches that impact vibrations generated by a tooth click "are higher in level by about 20 dB as compared with bone-conducted voice signals" (column 4, lines 49-51). However, surprisingly, as Applicant has discovered, this is not generally true since the signals associated with small tooth clicks may be as little as 6 dB larger (i.e., twice as large) than voice-related signals. According to Yoshizawa, if tooth clicks were indeed 20 dB larger (i.e., ten times as large) than voice signals, one would not require the use of a filter or logic circuit to discard factors unrelated to tooth clicks (i.e., vocalization). Applicant has determined that electronic filtering and a logic circuit are both important in detecting small tooth clicks reliably in the presence of vibrations unrelated to tooth clicks. Yoshizawa describes unacceptably large, strong tooth clicks, hence teaches away from Applicant's claimed invention. The effective detection of minimal tooth clicks is particularly desirable in Applicant's claimed invention to avoid tooth damage and assist persons who may have limited jaw movement (e.g., stroke patients or other disabled persons suffering from paralysis of facial or speech muscles).
- Yoshizawa does not disclose attaching a vibration sensor, capable of detecting mechanical vibrations, under the skin over the person's temporomandibular joint as recited in Applicant's new claims 25 and 46. Further, Yoshizawa does not disclose attaching a vibration sensor on the side of a person's head at a location to

sense mechanical vibrations of the person's temporomandibular joint, as recited in Applicant's new claims 29 and 50.

- Despite reference to "mastoid cells" (column 3, lines 61-62) in Yoshizawa and the Office Action's statement that Yoshizawa allegedly "teaches placing the microphone so as to receive signals using the mastoid of the head," Applicant submits that Yoshizawa's teaching of vibrations transmitted to the "mastoid cells" is erroneous and misleading. For clarity, Applicant has provided excerpts from "Gray's Anatomy. 36<sup>th</sup> Edition" (1980, Eds. Williams, P.L. and Warwick, R. Churchill Livingstone:London, pp. 328-329 and 1196), wherein the terms "mastoid cells" and "mastoid process" are defined and illustrated. The bony mastoid process is the conical protuberance of the posterior portion of the temporal bone which is situated behind the human ear. The "mastoid cells" mentioned by Yoshizawa are in fact "mastoid air cells" or cavities within the mastoid process as illustrated in Figure 7.289 on page 1196.
- Yoshizawa is an older patent (filed on December 16, 1980 and issued on July 5, 1983) compared to that of Nemirovski (filed July 2, 2001 and issued on October 3, 2002). The Office Action has combined the teachings of Nemirovski as its primary reference, with knowledge of tooth clicks in Yoshizawa. Applicant notes that Yoshizawa was not cited by Nemirovski, despite having issued in 1983 long before Nemirovski's application was filed; yet this advance of using tooth clicks was not at all recognized by Nemirovski, or even taught or motivated by any of the cited references alone or in combination prior to Applicant's present application.
- Applicant has identified contradictory teachings in Nemirovski and Yoshizawa which show that the combination of these references is clearly improper.

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Nemirovski indicates that acoustic microphones are suitable for detecting changes in air pressure (paragraph [0080]). In contrast, Yoshizawa teaches use of a vibration pick-up type microphone, namely a non-acoustic microphone:

The vibration pick-up type microphone is well known for picking up bone-conducted voice signals (which will be hereinafter referred to as vibrations) transmitted to the external auditory canal wall, mastoid cells, forehead, throat and the like, and picked-up vibrations are applied as inputs to convention transmitting or recording device causing the device to perform wireless or wired transmission or recording (column 1, lines 21-28).

The term "vibration pick-up type microphone" is acceptable terminology known to those skilled in the art for an accelerometer. Yoshizawa thus teaches away from any combination with Nemirovski.

- c) United States Patent Application Publication No. US 2003/0120183 to Simmons
- Simmons pertains to unrelated subject matter, namely an assistive clothing apparatus and process designed to measure movement of the entire body or particular body parts, and to support or maintain the body or body parts in desired positions under normal clothing.
  - Simmons does not disclose attaching a vibration sensor, capable of detecting mechanical vibrations, either on the person's head, preferably on the side of the head, or under the skin over the person's bony mastoid process or temporomandibular joint, as recited in Applicant's new claims 25 and 46.
  - Simmons does not disclose detecting with the sensor, mechanical vibrations elicited by sudden contact of the person's upper and lower teeth, as recited in Applicant's claims. Rather, Simmons describes data capture devices for

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placement inside the user's mouth. The devices generally include a battery, transmitter and keys. Switches are attached either directly to the back of the user's lower teeth (Figure 8) or on a retainer for placement in the user's mouth (Figure 9). Both devices are activated by the tongue, not by sudden contact of the person's upper and lower teeth, as recited in Applicant's claims.

- d) United States Patent No. 4,558,704 to Petrofsky
- Petrofsky pertains to unrelated subject matter, namely a hand control apparatus for a quadriplegic person. The system includes a control sensor which detects the person's shoulder movement and transmits the generated signals to a computerized controller. The controller then generates signals for stimulation electrodes within a cuff worn on the person's forearm to activate opening or closing of the hand. A glove is required for persons lacking feeling in their hands.
  - Petrofsky does not disclose attaching a vibration sensor, capable of detecting mechanical vibrations, either on the person's head, preferably on the side of the head, or under the skin over the person's bony mastoid process or temporomandibular joint, as recited in Applicant's new claims 25 and 46.
  - Petrofsky does not disclose detecting with the sensor, mechanical vibrations elicited by sudden contact of the person's upper and lower teeth, as recited in Applicant's new claims 25 and 46.

As summarized above, none of the references teach or suggest Applicant's invention as disclosed and claimed. In addition, there is no motivation to combine any of the references. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so

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found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art:

The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art. In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

The Office Action has selected Nemirovski's patent as the primary reference upon which all claim rejections have been based. However, Applicant submits that one skilled in the art, looking for a solution to the problems of assisting a person in controlling one or more devices or processes as addressed by Applicant's invention, would not look to any of the above cited prior art for any solution. Applicant has summarized the deficiencies of Nemirovski and the other cited prior art when considered individually as set out above.

Even if the art did consider the references chosen by the Examiner, the references themselves do not provide a suggestion of any success in combining the reference teachings to arrive at Applicant's claimed invention. The Office Action has combined the teachings of Nemirovski with knowledge of tooth clicks in Yoshizawa. The basis of this combination is that tooth clicks can be used to create changes in air pressure within the ear. This concept is far removed from Applicant's claimed invention. Nemirovski's ultimate intention is to detect air pressure changes within the ear (i.e., sound waves moving through air), not to detect mechanical vibrations elicited by a tooth click, as recited in Applicant's new claims 25 and 46. Compared to mechanical vibrations, vibrations in air have very different mechanical characteristics and are capable of detection by very different types of sensors. Nemirovski's method, together with the tooth clicks of Yoshizawa, is a combination which clearly does not suggest or teach Applicant's claim features or claimed invention in any event. Such a combination would be unsuccessful in achieving the purpose of Applicant's claimed invention, namely detection of mechanical vibrations elicited by tooth clicks for the purpose of generating an electrical control signal and transmitting the control signal to one or more devices or processes to be controlled.

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Further, Applicant has discussed that Yoshizawa was not cited by Nemirovski, despite having issued in 1983 long before Nemirovski's application was filed; yet this advance of using tooth clicks was not at all recognized by Nemirovski. Applicant emphasizes that despite knowledge of tooth clicks in the prior art, it was not obvious to Nemirovski to use the teachings of Yoshizawa for incorporation into Nemirovski's own device. Applicant has also identified contradictory teachings in Nemirovski and Yoshizawa which show that the combination of these references is clearly improper. Nemirovski indicates that acoustic microphones are suitable for detecting changes in air pressure, i.e., sound waves moving through air (paragraph [0080]). In contrast, as pointed out above, Yoshizawa teaches use of a vibration pick-up type microphone, namely a non-acoustic microphone (column 1, lines 21-22). The term "vibration pick-up type microphone" is accepted terminology well known to those skilled in the art for an accelerometer. Yoshizawa thus teaches away from any combination with Nemirovski.

Further, the Office Action's combination of Nemirovski and Simmons is considered improper. The Office Action states that the teachings of Simmons into Nemirovski's combined system improves the ability of disabled persons to move in a wheelchair in the event that a person's limbs are unable to move. The basis of this combination is that Simmons' mouth input means can be used to create changes in air pressure within the ear. Again, these combinations would not result in Applicant's claimed invention.

The Office Action's combination of Nemirovski in view of Yoshizawa and Simmons proposes using the tooth clicks of Yoshizawa or mouth input means of Simmons as a control signal to create changes in air pressure, as taught by Nemirovski. The fact that the references can be combined or modified is insufficient to establish *prima facie* obviousness. Combination of the references does not render the resultant combination as obvious, as the prior art does not suggest the desirability of the combination. There is no suggestion to one skilled in the art from these references, when taken alone or in combination, to conceive a design for detection of mechanical vibrations elicited by tooth clicks to control one or more devices or processes as claimed by Applicant, or to recognize the advantages thereof as disclosed by Applicant.

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Applicant respectfully disagrees with the Office Action's combination of Nemirovski in view of Petrofsky. The Office Action states that it would have been obvious to one skilled in the art to have incorporated the teachings of Petrofsky (i.e., a cuff having electrodes to stimulate muscles in a person's hand) into Nemirovski's combined system for the purposed of allowing a person the ability to move the person's hand in the event that the person is disabled. The Office Action adds Petrofsky's cuff to Nemirovski's method of detecting air pressure changes within the ear. It is not seen how this combination would work, or how the teachings would be combined or modified to arrive at Applicant's claimed invention. Such a combination lacks the detection of mechanical vibrations elicited by tooth clicks, which is a key concept in Applicant's invention.

Applicant submits that it is improper to reject any of these claims, or the claims dependent on these claims, under 35 U.S.C. §103(a). A *prima facie* case of obviousness has not been established. In summary, none of the cited references taken alone or in any combination renders obvious any of the claims of the present application. No combination of any of the cited prior art is warranted, since none of the references show the features of the invention as claimed in the present application. Even if a *prima facie* case of obviousness exists (which Applicant argues does not), the references do not equate to even the features of Applicant's claims 25, 26, 46 and 47. The features of the dependent claims are also absent from any combination of the references, for example, preferred placement of the sensor, preferred type of sensor, use of an electronic controller, filtering the electrical signal for vibrations unrelated to tooth clicks, and use of a signal generator to produce trains of electrical pulses to stimulate muscles or nerves.

### CONCLUSION

In view of the foregoing, it is submitted that this case is in condition for allowance, and passage to issuance is respectfully requested. If there are any outstanding issues related to patentability, the courtesy of a telephone interview is requested, and the Examiner is invited to call to arrange a mutually convenient time.

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This response is accompanied by a Petition for Extension of Time (one month) and the requisite fee in the amount of \$55.00 as required under 37 C.F.R. 1.17.

This response is also accompanied by an Information Disclosure Statement in accordance with 37 C.F.R. 1.98(b) and the requisite fee in the amount of \$180.00 for late submission of the Information Disclosure Statement.

Excess claim fees under 37 C.F.R. 1.16(c) in the amount of \$378.00 are also enclosed. If any amount submitted is incorrect, however, please charge any deficiency or credit any overpayment to Deposit Account No. **03-1740**.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the U.S. Postal Service in a sealed envelope as first class mail with postage thereon fully prepaid and addressed to **Mail Stop Amendment**, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the below date.

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